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REDIN SCORE : AS A PREDICTOR OF REHOSPITALIZATION FOR 30 DAYS AFTER DISCHARGE IN CONGESTIVE HEART FAILURE PATIENTS AT H. ADAM MALIK GENERAL HOSPITAL, MEDAN

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Abstract

Introduction: Heart failure (HF) is a problem facing the world, more than 20 million suffer from it. HF is associated with high frequency of hospitalization and duration length of stay. Redin Scoring is simple tool for short- and long-term risk to assess the severity of HF. The first study conducted by Álvarez-García regarding the use of the Redin Score as a prediction of rehospitalization of HF patients had a C-statistic value of 0.72 for 1 month rehospitalization.

Objective: To determine the Redin score which can be used as a predictor of rehospitalization after 30 days in patients with congestive heart failure at RSUP Haji Adam Malik Medan.

Methods: This study is a cohort study with a consecutive sampling technique. The study was conducted on HF patients who came at HAM Hospital Medan starting March 2020 to September 2020.

Results: From 53 patients, 42.8% patients were high risk REDIN score who underwent rehospitalization after 30 days, while low risk REDIN score was 2% patients. There was significant correlation between REDIN score and incidence of rehospitalization after 30 days post-treatment (p=0.01).

Conclusion: The REDIN score is a simple tool for predicting rehospitalization within 1 month of post-admission in patients with HF

Introduction

Heart failure is a clinical syndrome caused by a myocardial defect that causes impaired ventricular filling or blood ejection and produces typical signs and symptoms.[1,2] The prevalence of heart failure in developing countries is 2%. The prevalence of heart failure continues to increase with age and increases to 6-10% in patients older than 65 years old. In North America and Europe, the risk of developing heart failure at age 40 years old is one-fifth. The United States stated that 5.7 million US residents suffer for heart failure with an estimated prevalence increasing to 8 million cases in 2030.[3] The incidence of heart failure between 2000-2002 in Black, Hispanic, Caucasian, and Chinese populations in Americans based on MESA (Multi Ethnic Study of Atherosclerosis) criteria of 4.6; 3.5; 2.4; and 1.0 per 1000 person-years, respectively.[4]

Heart failure is classified as (1)Heart Failure with Reduced Ejection Fraction (HFrEF) and (2)Heart Failure with impaired diastolic function (systolic function or normal ejection fraction) or referred to as Heart Failure with Preserved Ejection Fraction (HPFEF). In addition, myocardial remodeling will also continue and cause a clinical syndrome of heart failure.[5] In the first type of heart failure, HFrEF, symptoms of pulmonary congestion will appear due to an increase in cardiac preload which causes impaired myocardial contractility so that left ventricular pressure increases, as well as pulmonary capillary hydrostatic pressure.[6] The HFPEF type of heart failure is a sum of symptoms that are characterized by abnormalities in ventricular diastolic function, such as impaired early diastolic relaxation (an active energy-dependent process), increased ventricular wall stiffness (passive), to manifestations of vascular congestion.[6,7]

Heart failure is often associated with high frequency of hospital stays and length of stay, and the lenght of stay is considered as an indicator of treatment efficiency.[8] Hospitalization is also one of the the risk of increased mortality.[9,10] The average length of stay in hospital (ALOS) is defined as the average number of days for a patient to be hospitalized. The length of stay of heart failure patients varies widely in various countries with a range between 4 - 21 days. The shortest length of stay was reported from Oregon, USA, which was 4 days.[11] Bueno et al stated that the decrease in length of stay and mortality in the hospital was followed by increase in the rate of readmission and mortality 30-days after discharge.[12]

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The Redin score is an easy and simple tool for short-term (>5%) and long-term (almost 30%) risk stratification in assessing the severity of heart failure. The Redin score was developed in Spain by gathering epidemiological information and clinical patterns which are further useful as an efficient and equitable source of therapeutic and predictive 1-month rehospitalization in heart failure patients. The Redin score requires three to six variables, including clinical history, physical examination, ECG, blood tests, echocardiographic, therapy, BNP/NT-proBNP levels, pulse rate, signs of target organ damage such as anemia and eGFR, and left atrial size (sign of cardiac remodeling).[13]

In this study, the authors aimed to use the Redin score as a predictor of rehospitalization for 30 days post-treatment in patients with congestive heart failure at Haji Adam Malik General Hospital Medan.

Method

Research Population

This research is a cohort study with consecutive sampling technique. The research subjects were patients with congestive heart failure who were hospitalized at H. Adam Malik General Hospital Medan in the period March 2020 – September 2020 who met the inclusion criteria. The inclusion criteria were age >18 years old, done clinical examination that supported congestive heart failure diagosis, a history of heart failure treatment, and there was an abnormality in at least one of the echocardiographic (ejection fraction 40%, left ventricular diameter at end-diastolic 60 mm, presence of diastolic dysfunction, interventricular/posterior septal thickness 14 mm).

The study involved 53 patients with congestive heart failure. Patients with incomplete medical records, severe valvular disease requiring surgery, right heart failure secondary to chronic cor pulmonale, and terminal disease were excluded from the study.

Redin Score Assessment

The Redin score will be calculated based on data taken from the medical record at the time the patient was admitted, there are demography data, physical examination, electrocardiography (ECG), echocardiography, and laboratory examinations when the patient was admitted to the hospital. All data will be analyzed with SPSS 20 to get the Redin score.

Statistic Analytic

Data were analyzed using SPSS version 20. Categorical variables were presented with number/frequency (n) and presentation (%). Numerical variables are presented by mean and standard deviation for the data that are normally distributed, while numeric data that are not normally distributed use the median. Numerical variable normality test using *Kolmogorov Smirnov* (n>50). Then bivariate analysis using unpaired t-test or Mann Whitney test on numeric variables, while on categorical variables using Chi-Square. Multivariate analysis using logistic regression will be statistically significant with p value <0.05.

Results and Discussion

The subjects in this study were 53 patients with congestive heart failure, which 14 patients (26.4%) underwent rehospitalization for 30 days after discharge and the remaining 39 patients (73.6%) did not undergo rehospitalization. The mean age of the patients was 57 years, with patients undergoing rehospitalization were older (58.25±14.03 years) and male dominated (male: female ratio 3:1). There was a significant difference in the TDD variable of CHF patients with rehospitalization after 30 days compared to patients who did not undergo rehospitalization (p=0.025). The levels of NT-proBNP in subjects undergoing rehospitalization were higher than those in non-rehospitalized subjects ($p < 0.05$). From the echocardiographic examination data, patients undergoing rehospitalization had a smaller LA size, higher LVED, and a higher left ventricular ejection fraction than those who did not undergo rehospitalization, but they were not significantly different (p>0.05). The basic characteristics of the research subjects are presented in table 1.

There are several predictive models for rehospitalization of heart failure patients but most of these models have some drawbacks such as low discrimination value for each patient,[14,15] using parameters that are not routinely available in clinical practice,[16] and the C-statistical value in the rehospitalization prediction model is lower than in the mortality prediction model.[17] The study by Alvarez-García et.al stated the components of the Redin score are Framingham sign of left heart failure, eGFR <60 mL/min/m2, and BNP > 43 pmol/L (> 150 ng/L) or NT-

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proBNP > 118 pmol /L (> 1000 ng/L) as an independent predictor of 1-month rehospitalization and components of heart rate >70 beats per minute, anemia, and left atrial size >26 mm/m2, can be used as predictors of 1-year rehospitalization. The Redin score also had C-statistical values of 0.72 and 0.66 for 1 month and 1 year rehospitalization, respectively. This C-statistical value was found to remain consistent after external validation with a loss of discrimination value of less than 5%.[13]

Table 1. Characteristics of the research subjects

Parameter	Total (n=53)	Rehospitalization 30 days		OR (CI 95%)	P value
		Yes (n=14)	No (n=39)		
Age, years old	57,15±11,59	58,25±14,03	56,67±10,54	-	0,654
Sex					
Man	38 (71,7)	10 (26,3)	28 (73,7)	0,658 (0,291-1,489)	0,342
Woman	15 (28,3)	6 (40,0)	9 (60,0)		
Smoking	36 (67,9)	10 (27,8)	26 (72,2)	0,787 (0,343-1,808)	0,578
Dyslipidemia	4 (7,5)	0 (0,0)	4 (100,0)	-	0,303
Diabetes Melitus	14 (26,4)	6 (42,9)	8 (57,1)	1,671 (0,746-3,747)	0,311
Hypertension	29 (54,7)	10 (34,5)	19 (65,5)	1,379 (0,586-3,245)	0,454
BMI	23,87 (17,57-33,76)	21,74 (17,57-33,06)	24,48 (17,99-33,76)	-	0,138
TDS	110 (80-150)	100 (80-140)	110 (80-150)	-	0,132
TDD	70 (40-90)	66,5 (40-81)	70 (50-90)	-	0,025
HR	76,94±11,41	77,31±13,19	76,78±10,75	-	0,879
Hb	12,89±1,97	12,49±2,38	13,07±1,78	-	0,333
Ht	38,00±6,10	37,81±7,27	38,08±5,63	-	0,885
Creatinin	1,02 (0,40-4,88)	1,39 (0,67-2,16)	0,85 (0,4-4,88)	-	0,055
NT-proBNP	1890 (400-8002)	1956 (1198-2880)	920 (400-8002)	-	0,001
eGFR	56,73 (10,84-273,77)	44,11 (25,02-154,27)	66,99 (10,84-273,77)	-	0,021
LA Size	38,84±5,10	38,31±4,98	39,08±5,20	-	0,620
LVED	54,15±9,56	55,50±12,43	53,56±8,15	-	0,505
LVEF	41 (21-66)	43 (23-60)	38 (21-66)	-	0,808
NYHA III-IV					
Yes	14 (26,4)	10 (71,5)	4 (28,5)	1,520 (0,672-3,440)	0,001
No	39 (73,6)	5 (12,8)	34 (87,1)		
Framingham Sign (Right)					
Yes	52 (98,1)	16 (30,8)	36 (69,2)	-	1,000
No	1 (1,9)	0 (0,0)	1(100,0)		
Framingham Sign (Left)					
Yes	3 (5,7)	1 (33,3)	2 (66,7)	1,111 (0,212-5,817)	1,000
No	50 (94,3)	15 (30,0)	35 (70,0)		
MR II/IV					
Yes	13 (24,5)	4 (30,8)	9 (69,2)	1,026 (0,4-2,633)	1,000
No	40 (75,5)	12 (30,0)	28 (70,0)		
REDIN Score	**25 (0-30)**	**20,7 (20-30)**	**4,8 (0-19)**	**-**	**0,001**

REDIN score in patients with congestive heart failure in this study had a median score of 24 and who undergoing rehospitalization had a higher median REDIN score of 24.8. REDIN scores for patient who underwent rehospitalization for 30 days after discharge were categorized into two groups, low risk (score 0-19) and high risk (score 20-30). The proportion of patients with a high-risk REDIN score was 42.8% while the proportion of low-risk REDIN score was 8%, and there was a significant relationship between the REDIN score and the incidence of rehospitalization for 30 days after discharge (p = 0.01) (Table 2).

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Tabel 2 The relationship between REDIN scores and the incidence of rehospitalization during 30 days post-treatment in patients with congestive heart failure

		Rehospitalization 30 days, n(%)		Total	P value
		Yes (n=14)	No (n=39)		
REDIN score	Low risk	2 (8,0)	23 (92,0)	25 (100,0)	0,010
	High risk	12 (42,8)	16 (57,1)	28 (100,0)	
	Total	14 (26,4)	39 (73,6)	53 (100,0)	

In Dunlay et.al's study, involving 1077 heart failure patients, the number of hospitalizations occurred 4359 times in a follow-up period of 4.7 years after the diagnosis of heart failure. It was found that 83.1% of patients were hospitalized at least once; where 66.9%, 53.6% and 42.6% were hospitalized 2, 3, and 4 times, respectively. However, in fact, the cause of hospitalization in heart failure patients, which is a cardiovascular cause, is only 21.6%, while the remaining 61.9% are non-cardiovascular causes. Comorbid diseases in patients with heart failure such as kidney disease, psychiatric disorders, and diabetes mellitus are additional components that play a role as a cause of hospitalization.[18]

Conclusion

There is a significant correlation between Redin score and the incidence of rehospitalization for 30 days after discharge in patients with congestive heart failure who are treated at H. Adam Malik Hospital, Medan. However, there are shortcomings in terms of the small number of samples and not making further records related to the specific causes of rehospitalization and only relying on all-cause hospitalization criteria.

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